The Integrative Molecular and Biomedical Sciences Graduate Program (IMBS) offers a multidisciplinary environment that provides the brightest and most ambitious students with skills needed to become leaders in diverse scientific disciplines. Our goal is to prepare the next generation of pioneers in biomedical science. Challenging courses, attentive mentoring, and the resources of the largest medical center in the world enable us to meet that goal. Our program will give you the advantage needed to succeed in your scientific career. We have incorporated the best things about traditional graduate programs—depth of focus and stellar faculty—while eliminating departmental boundaries, rigid curricula and restricted choices. The IMBS Program couples academic rigor with scientific creativity, and breadth of choice with intimate scale. Students enjoy intensive academic training in small group formats and the freedom to design an individualized curriculum with personal guidance from our co-directors.

Throughout your graduate studies, you will keep up-to-date with the research in other IMBS labs, maintaining the Program’s integrative theme even after you join a specific lab. Upon graduation, you will have a solid foundation in the concepts and cutting-edge techniques of modern biology and will appreciate the integration of diverse approaches and systems. You will be the world-expert on your research topic.

Research training is built on the same fundamentals as your future scientific career: critical thinking, leadership, team-building, intensive research, and networking skills, combined with one-on-one mentoring.

The IMBS program has been supported for 25 years by a competitive training grant from the National Institute of General Medical Sciences (GM008231).
EMPHASIS ON FACULTY-STUDENT INTERACTION
A first-year class size of only 14 to 17 students ensures a personal level of interaction between faculty and students that cannot always be achieved in larger graduate programs. As a result, each student receives individual attention from faculty, even before they join a thesis lab. IMBS co-directors provide academic advice, meeting individually with you to recommend courses based on your interests and academic background, and to help you identify and evaluate lab rotations. Co-directors and other IMBS faculty participate in the Directors’ Course exclusively for first-year IMBS students, providing ample opportunity to interact closely and learn with highly successful faculty.

This attention does not end once you join a laboratory. The five co-directors diligently follow the progress of each student from admission to graduation from the IMBS program.

APPLICATION REQUIREMENTS AND PROCESS
Applicants should have a bachelor’s degree (or the equivalent) in a relevant area of science with coursework in biology, chemistry, and biochemistry. Research experience is strongly recommended.

- Complete the FREE on-line application
- Personal statement about your research experience and career goals
- Official transcripts from each college or university attended
- Three letters of recommendation; at least one from a research supervisor
- Official GRE scores (not more than three years old); the General test is required; the Subject test is recommended
- TOEFL is required for foreign applicants who attended a non-English-speaking university. Test scores must not be more than two years old at time of application.

FIRST-YEAR CURRICULUM
A wide range of courses is available during the first year, including core courses (taught by the Graduate School) and specialty courses (offered by individual departments & programs).

The academic year is organized into five terms, each two months long. Most students take six to eight hours of coursework each term, leaving plenty of time for research rotations in potential thesis laboratories. You can complete the required 30 didactic course hours by the end of the first year.

Your first-year curriculum can be individualized to compliment courses taken during your undergraduate and/or master’s studies. To ensure you have acquired a broad base of knowledge by the end of the first year, we offer a curriculum that mixes elective courses with required courses and flexible required courses. The courses will provide you with a solid foundation in modern molecular and cellular biology and their application to human disease-related research.

REQUIRED COURSES

**Term 1**
- Organization of the Cell (2 hrs.)
- Molecular Methods (3 hrs.)
- Genetics A (2 hrs.)
- Science as a Profession - Ethics Years 1-4 (2 hrs.)

**Term 2**
- Cell Division (2 hrs.)
- Method and Logic in Molecular Biology (3 hrs.)

**Term 3**
- Macromolecules: Structure and Interactions (3 hrs.)
- Gene Regulation (3 hrs.)

FLEXIBLE REQUIRED COURSES
Choose a least one course from each of the five categories:

**Category 1 — Cancer/Aging**
- Term 2: Cancer (1 hr.)
- Term 4: Introduction Molecular Carcinogenesis (3 hrs.)
- Term 4: Translational Cancer Biology (2 hrs.)
- Term 4: Biology of Aging and Age Related Diseases (3 hrs.)

**Category 2 — Genetics**
- Term 2: Genetics B (2 hrs.)
- Term 3: Mammalian Genetics (2 hrs.)
- Term 4: Genetics of Animal Viruses* (3 hrs.)
- Term 4: Gene and Cell Therapy (2 hrs.)

**Category 3 — Development/Neuroscience**
- Term 2: Development (2 hrs.)
- Term 3: Evolutionary Conservation of Developmental Mechanisms (3 hrs.)
- Term 3: Neuroscience (1 hr.)
- Term 4: Neural Development (3 hrs.)
- Term 4: Concepts of Learning and Memory (2 hrs.)
- Term 4: Neurobiology of Disease (3 hrs.)

**Category 4 — Immunology/Microbiology/Virology**
- Term 2: Immunology (3 hrs.)
- Term 2: Bacterial Structure and Function (3 hrs.)
- Term 3: Immunology (1 hr.)
- Term 3: Regulation of Immune Responses (3 hrs.)
- Term 4: Molecular Immunology (3 hrs.)

**Category 5 — Statistical/Quantitative Analysis**
- Term 4: Introduction to Biostatistics (2 hrs.)
- Term 4: Biostatistics for Translational Researchers (3 hrs.)

*odd years only*
**PROGRAM-SPECIFIC COURSES**

An important feature of the IMBS Program is a pair of courses specifically designed for IMBS students.

**DIRECTORS’ COURSE**

- This course is exclusively for first year IMBS students and is taught by IMBS directors and faculty. Students will develop both practical and intellectual skills. Each student is mentored to critically evaluate the primary scientific literature, design and interpret experiments, give chalk talks and oral presentations, and develop and defend an NIH-style grant proposal. The friendly format enables each student to excel and get to know the directors early in their graduate career, and encourages close working relationships between IMBS classmates.

**IMBS SEMINAR**

- In this weekly IMBS student-run seminar series students present an annual research update. There is extensive student dialogue and exchange during the question-and-answer period that enhances the integrative goals of the program. Students display an amazing degree of intellectual rigor and analysis, get fully engaged in each other’s research progress, and gain an appreciation for evolving models and developing technologies in diverse fields. Through these seminars, IMBS students develop scientific presentation skills that have earned awards at national and international meetings and rival those of any Ph.D. student in the U.S.

**RESEARCH ROTATIONS**

Two-month (each term) research rotations allow students to sample three to five different IMBS laboratories to choose a mentor and thesis lab. Three rotations are required prior to making a lab choice. This opportunity to perform experiments and get to know members of a lab provides you with the information needed to choose your thesis lab. Research rotations also help you develop a network of contacts from different IMBS labs around the BCM campus.

Houston is home to one of the most heterogeneous populations nationally, if not worldwide, and BCM seeks to reflect our community with regard to gender, culture and life experiences, age, disability, race, ethnicity, geography, religion, sexual orientation and socioeconomic status. Diversity strengthens our institution by increasing talent and ensuring a fuller perspective. It helps BCM to reduce disparities in health and healthcare access, to address the needs of the community we serve, and to achieve our organizational goals.

Thus, BCM is committed to the recruitment and retention of excellent students, trainees, faculty and staff who represent the full diversity of Houston and our nation, and to the provision of a welcoming, supportive environment for all members of the BCM community.
DEPARTMENT OF MOLECULAR AND CELLULAR BIOLOGY
KEITH SYSON CHAN, Ph.D.

• Unthecal cancer stem cells in metastasis and therapeutic responses.

ERIC CHANG, Ph.D.

• Growth and migration regulation by Ras G-proteins.

ORLA M. CONNELLY, Ph.D.

• Nuclear receptors in hematological cancers.

XIN-HUA FENG, Ph.D.

• Protein modifications and cell signaling in cell fate determination, development and cancer.

MILAN A. JARIICH, M.D.

• Role of homeobox and forkhead genes in vertebrate eye development.

DEBORAH L. JOHNSON, Ph.D.

• Key downstream transcription factor targets of oncogenic signaling pathways and tumor suppressors that regulate cellular metabolism and oncogenesis.

WEI-CHIN LIN, M.D., Ph.D.

• Cell cycle regulators and novel cancer therapeutic targets.

DAVID D. MOORE, Ph.D.

• Nuclear hormone receptors regulate metabolism and cancer.

HOANG NGUYEN, Ph.D.

• Skin epithelial stem cell fate maintenance and lineage determination.

BRET W. O’MALLEY, M.D.

• Stabilization of transcriptional activators regulates gene expression in normal and disease states.

JOANNE S. RICHARDS, Ph.D.

• Hormonal control of ovarian follicle development, resolution and cancer.

JEFFREY M. ROSEN, Ph.D.

• Mammary gland development and breast cancer.

DAVID R. ROWLEY, Ph.D.

• The tumor microenvironment in cancer progression.

MING-JER TSAI, Ph.D.

• Transcription factors in development and diseases.

NANCY L. WEIGEL, Ph.D.

• Stem cells and cell signaling in prostate and breast cancer.

LI XIN, Ph.D.

• Prostate epithelial stem cells, hematogenesis and carcinogenesis.

JIANMING XU, Ph.D.

• Transcriptional control of development and hormonally promoted breast and prostate cancers.

DEPARTMENT OF MOLECULAR AND HUMAN GENETICS
DAVID B. BATES, Ph.D.

• Chromatin dynamics, molecular mechanisms of DNA replication, and cell cycle control in E. coli.

ARTHUR L. BEAUDET, M.D.

• Neurologic neoplasms; molecular mechanisms for human DNA rearrangements, genomic disorders, copy number variation (CNV) and disease.

MICHAEL L. METZKER, Ph.D.

• Next-generation technology for genome sequencing; novel fluorescence imaging; molecular genetics of diabetics; phylogenetic analysis of HIV-1 transmission between individuals.

DAIYUKI NAKADA, Ph.D.

• Molecular and genetic analysis of cell stem function and cancer.

DAVID L. NELSON, Ph.D.

• Human genetic disorders; fragile X syndrome; unstable DNA and neurodegeneration.

SUSAN H. ROSENBERG, Ph.D.

• Genome instability in evolution, cancer and antibiotic resistance.

MARCIO SARDIELLO, Ph.D.

• Regulatory networks of cell metabolism and neurological disorders.

KENNETH L. SCOTT, Ph.D.

• Cancer gene discovery, pathways governing tumor metastasis; animal models for cancer.

GAD SHAIULSKY, Ph.D.

• Allelorecognition, evolution of sociality and functional genomics in Dictostelium.

CHENGHANG ZONG, Ph.D.

• Single cell analyses for tumorigenesis and stem cell differentiation.

DEPARTMENT OF MOLECULAR PHYSIOLOGY AND BIOPHYSICS
MARY E. DICKSON, Ph.D.

• Vital microscopy of heart development and angiogenesis.

WILLIAM R. LAGOR, Ph.D.

• Regulation of lipid and lipoprotein metabolism.

IRINA V. LARINA, Ph.D.

• Development and application of highly innovative methods for live dynamic imaging and analysis of mammalian embryonic development.

JOEL NEILSON, Ph.D.

• Post-transcriptional gene regulation in mammalian development and disease by microRNA and RNA-binding proteins.

STEEN E. PEDERSEN, Ph.D.

• Ion channel function and structure.

ROSS A. POCHE, Ph.D.

• Transcriptional regulation of neural progenitor proliferation and differentiation; ocular vesicle remodeling and regeneration; fly retinal neurons and eye vascular microphysiography; regenerative medicine.

JOSHUA D. WYTHE, Ph.D.

• Elucidating the regulatory networks governing cardiovascular development and disease.

XANDER H.T. WEHRENS, M.D., Ph.D.

• Regulation of cardiac ion channels in normal and diseased hearts.

PUMIN ZHANG, Ph.D.

• Cell-cycle regulation in development and disease.

DEPARTMENT OF MOLECULAR VIROLOGY AND MICROBIOLOGY
ROBERT A. BRITTON, Ph.D.

• Therapeutic microbiology, probiotics, genomics and genetics of the human microbiota.

JANET S. BUTEL, Ph.D.

• Adenoviruses and viral oncology.

JASON T. KIMATA, Ph.D.

• Molecular mechanisms regulating vital-intestinal cell interactions and pathogenesis of infection and disease.

MARY K. ESTES, Ph.D.

• Molecular mechanisms regulating vital-intestinal cell interactions and pathology.

JOSPEH M. HYSER, Ph.D.

• Enteric virus calcium channel blockers.

RONALD T. JAVIER, Ph.D.

• Adenovirus and viral oncology.

JASON T. KIMATA, Ph.D.

• Mechanisms of retroviral persistence and disease.

RICHARD E. LLOYD, Ph.D.

• Control of translation in virus infection and cell stress.

ANTHONY W. MARESSO, Ph.D.

• Pathogenesis of bacterial infections.

JOSEPH F. PETROSINO, Ph.D.

• Functional genomics of biodiversity and emerging infectious disease pathogens.

REBECCA RODRO RICO, Ph.D., M.P.H

• Mosquito transmission and pathogenesis of dengue viruses, using a new, humanized mouse model of disease.

BETTY L. SLAGLE, Ph.D.

• Viral hepatitis and liver cancer.

LYNN ZECHIEDRICH, Ph.D.

• Antibiotic resistance, DNA structure/function, non-viral DNA vectors for gene therapy.

DEPARTMENT OF NEUROSCIENCE
JEFFREY L. NOEBELS, M.D., Ph.D.

• Gene control of neuronal network excitability.

DEPARTMENT OF PATHOLOGY AND IMMUNOLOGY
THOMAS A. COOPER, M.D.

• Alternative splicing regulation in development and disease.

H. DANIEL LACORAZZA, Ph.D.

• Genetic control of hematopoiesis; Mouse models to study the pathobiology and treatment of lymphoid and myeloid leukemias.

DARIO MARCETTI, Ph.D.

• The biology, biomarker discovery, and therapeutic utility of Circulating Tumor Cells (CTCs) in cancer metastasis.

GRAEME MARDON, Ph.D.

• Molecular mechanisms controlling retinal development.

RICHARD N. SIFERS, Ph.D.

• Cologenetics, pretranslational disease modifiers; conformational disease.

JAMES VERSALOVIC, M.D., Ph.D.

• The intestinal microbiome, beneficial microbes and host interactions, probiotics, innate immunity, and intestinal inflammation.

JIN WANG, Ph.D.

• Molecular regulation of immune responses by apoeptosis and autophagy.

LAISING YEN, Ph.D.

• DNA-based molecular switches and biosensors; cancer transcriptional analyses.

DEPARTMENT OF PEDIATRICS
ALISON A. BERTUCH, M.D., Ph.D.

• Telomere structure, maintenance and function, and DNA double-strand break repair.

MARIA ELENA BOTTAZZI, Ph.D.

• Translational research and vaccine development for neglected tropical diseases.

LONING FJ, Ph.D.

• Role of the circadian clock in cancer development and therapy.

MARGARET A. GOODELL, Ph.D.

• Molecular regulation of hematopoietic stem cells.

STEPHEN GOTTSCALK, M.D.

• Cancer immunotherapy with antigen-specific T cells.

KENDAL D. HIRSCHI, Ph.D.

• Plant biology related to human nutrition and environmental issues.

PETER J. HOTEZ, M.D., Ph.D.

• Neglected tropical diseases and vaccine development.

SHARON E. PLOEN, M.D., Ph.D.

• Genetic susceptibility to cancer; molecular mechanisms that control genomic stability.

YONG XU, M.D., Ph.D.

• Understanding CNS control of body weight, glucose balance, and cardiovascular functions.

JASON T. YUSTEIN, M.D., Ph.D.

• Insights into molecular pathogenesis of pediatric sarcomas.

HUDA Y. ZOGBI, M.D.

• Molecular pathogenesis of neurodegenerative and neurodevelopmental disorders.

DEPARTMENT OF PHARMACOLOGY
PULI-KWONG CHAN, Ph.D.

• Antitumor agents and mechanism.

TIMOTHY G. PALZELK, Ph.D.

• Antiasthma resistance; protein structure-function; protein-protein interactions.

JIN WANG, Ph.D.

• Nanomedicine for cancer and cardiovascular disease. Molecular probes for biomedical and biological imaging.

DAMIAN young, Ph.D.

• Synthetic organic chemistry; fragment-based drug discovery; disease-oriented synthetic medicinal chemistry; chemical biology.

INTERSTITUTIONAL FACULTY
UT MD ANDERSON CANCER CENTER
Jennie CHEN, Ph.D.

• Mechanisms underlying genomic instability and cancer development.

MICHAEL J. GALKO, Ph.D.

• Molecular genetics of tissue repair responses in Drosophila.

THE METHODIST HOSPITAL RESEARCH INSTITUTE
HENRY POWNALL, Ph.D.

• Identification of the molecular basis of diseases associated with ethnococciosis, obesity, and alcoholic hepatitis, and hypothyroidic dietary; dietary studies in human subjects and in animal models, cell culture and gene regulation.

STEPHEN WONG, Ph.D.

• Molecular biology and imaging for drug repositioning, targets discovery, and clinical diagnosis and intervention in cancer and neurological disorders.